ACCES I/O PRODUCTS, INC.

FEATURES

- High-speed USB 2.0 Multifunction DAQ
- Sustained sampling rates up to 1MHz
- 16-bit or 12-bit resolution A/D converter
- Flexible, software configured functionality
- 16 single ended or 8 differential inputs
- 8 input ranges, 4 unipolar and 4 bipolar, channel-by-channel programmable
- Autocal and oversampling for real-time accurate data
- A/D starts via software, timer, or external trigger
- Two or four 16-bit analog outputs; 4kHz update rate
- 16 high-current digital I/O lines
- Alternate embedded USB connector
- USB/104 form-factor for embedded OEM's
- Small (4" x 4" x 1.25") rugged industrial enclosure
- All required power drawn from USB port for typical applications

FACTORY OPTIONS

- Pseudo-differential analog inputs
- External power via DC jack or screw terminal
- RoHS compliant module
- OEM (board only) version for embedded applications
- Single-ended current inputs (4-20mA, 10-50mA)
- Voltage dividers per input
- Extended Temperature Operation -40 to +85°C

FUNCTIONAL DESCRIPTION

The USB-AIO16-16F is an ideal solution for adding portable, easy-to-install high-speed analog and digital I/O capabilities to any computer with a USB port. The board is plug-and-play allowing a quick connection whenever you need additional I/O on the convenience of a USB port. Also, the unit is a high-speed USB 2.0 device, offering the highest speed available on the USB 2.0 bus.

The USB-AIO16-16F is a 16-bit resolution A/D board capable of sampling speeds up to 1MHz (in real-time Operating Systems) for it's 16 single-ended, (16 pseudo-differential optional), or 8 differential analog inputs. Each channel can be independently software configured to accept 8 different input ranges. A unique, real-time internal calibration system allows the card to continually compensate for offset/gain errors giving a more accurate reading. Additional features include 16 digital I/O lines and 0, 2, or 4 analog outputs.

This small, compact, multifunction I/O board provides the user with everything needed to start acquiring, measuring, analyzing and monitoring in a variety of applications. The USB-AIO16-16F data acquisition board can be used in many current real-world applications such as embedded equipment monitoring, precision PC-based and portable environmental measurements, and mobile data acquisition. The board is designed to be used in rugged industrial environments but is small enough to fit nicely onto any desk or testing station. The board is PC/104 sized (3.550 by 3.775 inches) and ships inside a steel powder-coated enclosure with an anti-skid bottom.

OEM USB/104 FORM FACTOR

The OEM (board only) version is perfect for a variety of embedded applications. What makes the OEM option unique is that its PCB size and pre-drilled mounting holes match the PC/104 (3.550 by 3.775 inches) form factor (without the bus connections). This ensures easy installation using standard standoffs inside most enclosures or systems. For embedded OEM applications, a miniature USB input header is provided in parallel with the type B connector.
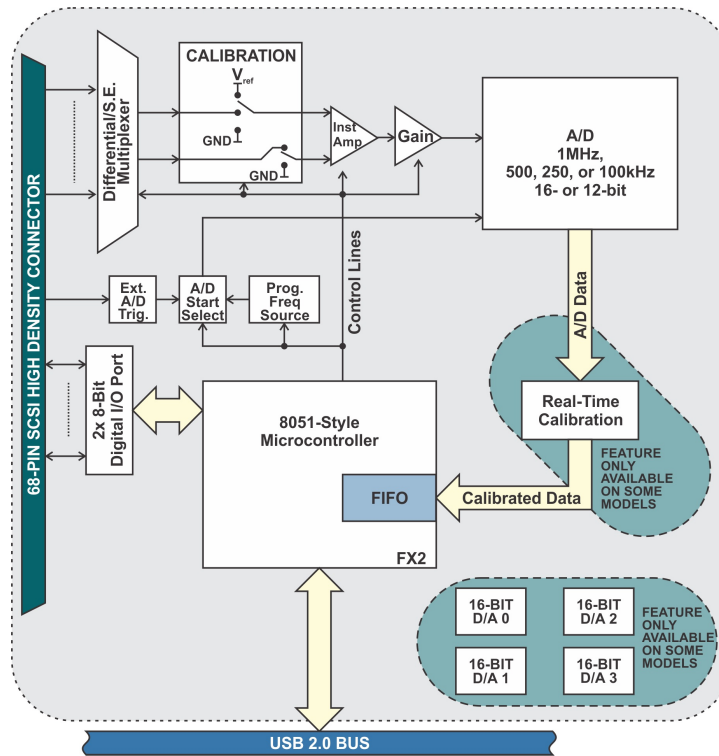
ACCESSORIES

The USB-AIO16-16F is available with optional cable assemblies and screw terminal boards for easy-to-use, out of the box connectivity. The STB-68 Kit is a compact screw terminal board that mounts directly on top of the USB-AIO enclosure, and must be ordered at the same time as the USB-AIO module.

SOFTWARE

The USB-AIO16-16F utilizes a high-speed custom function driver optimized for maximum continuous data throughput of 4 MB/s that is hundreds to thousands of times faster than the USB human interface device (HID) driver used by some competing products. This approach maximizes the full functionality of the hardware along with capitalizing on the advantage of high-speed USB 2.0. The module is supported for use in most USB supported operating systems and includes a free Linux and Windows compatible software package. This package contains sample programs and source code in C#, Delphi and Visual C++ for 32-bit and 64-bit Windows. Also incorporated is a graphical setup program in Windows. Third party support includes a Windows standard DLL interface usable from the most popular application programs, and includes LabVIEW VIs. Embedded OS support includes the family of Windows Operating Systems including IoT.

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Feb 2nd 2018

BLOCK DIAGRAM

SPECIFICATIONS

Analog Inputs

ADC Type	Successive approximation
Resolution	16-bit, 12-bit
Sampling rate	
"16-16F" version	1M samples/sec (maximum aggregate)
"16-16A" version	500k samples/sec (maximum aggregate)
"16-16E" version	250k samples/sec (maximum aggregate)
"12-16A" version	500k samples/sec (maximum aggregate)
"12-16" version	250k samples/sec (maximum aggregate)
"12-16E" version	100k samples/sec (maximum aggregate)
Number of channels	16 s.e. or 8 differential (software selectable)
	(16 pseudo-differential factory option available)
Unipolar ranges	0-1V, 0-2V, 0-5V, 0-10V (software selectable)
Bipolar ranges	±1V, ±2V, ±5V, ±10V (software selectable)
4-20mA or 10-50mA	Factory installed (optional)
Calibration Hardware	
"16-16F" version	Two on-board references + calibrated real-time output
"16-16A" version	Two on-board references + calibrated real-time output
"16-16E" version	Two on-board references
"12-16A" version	Two on-board references + calibrated real-time output
"12-16" version	Two on-board references
"12-16E" version	None
System Calibration	Program provided to calibrate entire system
Accuracy	
Uncalibrated	0.094% Full-Scale (FS)
Calibrated[1]	0.0015% FS
Int Nonlinearity Error	0.0011% FS
No Missing Codes	16 bits
Input impedance	1MΩ
A/D Start Sources	Software Start, Timer Start, and External Start Trigger (rising or falling edge; software selectable)
A/D Start Enable	Externally supplied (pulled-up; active-high)
A/D Start Types	Single Channel or Scan (software selectable)
Channel Oversamp.	0-255 consecutive samples/channel
Over volt protection	-40 to +40V
Crosstalk	-53dB @ 1MHz
	-84dB @ 500kHz

[1] To achieve best accuracy, one must calibrate to their own standard.

Analog Outputs

Number	0, 2, or 4
Type:	Single-ended
Resolution:	16-bit
Unipolar Ranges:	0-5V, 0-10V (factory configured)
Bipolar Ranges:	±5V, ±10V (factory configured)
Conversion Rate:	4kHz per channel
Settling Time	4us typ, 7us max; 1/4 to 3/4 scale to ±2LSBs
Output Current	±10mA per channel

Digital I/O

Lines	16, prog. as in or out in groups of 8 (pulled-up via 10KΩ)	
Inputs	Logic low:	0V(min) to 0.8V(max) ±20µA (max)
	Logic high:	2V(min) to 5V(max) ±20µA (max)
Outputs	Logic low:	0V(min) to 0.55V(max) 64mA(max) sink
	Logic high:	2V(min) to 5V(max) 32mA(max) source

Environmental

Operating Temp.	0° to +70°C, optional -40° to +85°C
Storage Temp.	-40° to +105°C
Humidity	5% to 95% RH, without condensation
Board Dimensions	PC/104 format, 3.550" by 3.775" w/mounting holes
Power required	+5V at 315mA typical

Ordering Guide

USB-AIO16-16F	16-Bit, 1MHz, Advanced Cal HW and 2 analog outputs
USB-AIO16-16A	16-Bit, 500kHz, Advanced Cal HW and 2 analog outputs
USB-AI16-16A	Same as above but with no analog outputs
USB-AIO16-16E	16-Bit, 250kHz, Standard Cal HW and 2 analog outputs
USB-AI16-16E	Same as above but with no analog outputs
USB-AIO12-16A	12-Bit, 500kHz, Advanced Cal HW and 2 analog outputs
USB-AI12-16A	Same as above but with no analog outputs
USB-AIO12-16	12-Bit, 250kHz, Standard Cal HW and 2 analog outputs
USB-AI12-16	Same as above but with no analog outputs
USB-AIO12-16E	12-Bit, 100kHz, with 2 analog outputs
USB-AI12-16E	Same as above but with no analog outputs

Model Options

• -OEM	Board only (no enclosure)
• -RoHS	Compliant module
• -T	Extended Temperature Operation (-40° to +85°C)
• -P	External AC/DC adapter (power jack/regulator installed)
• -ST	Screw terminals for external power
• -I	Single-ended 4-20mA inputs
• -S0x	Special configurations (input voltage dividers, conf. coating etc.)
• -PD	Pseudo-Differential analog Inputs
• -4AO	Four analog outputs
• -5U	Unipolar 0-5V analog outputs
• -5B	Bipolar ±5V analog outputs
• -10U	Unipolar 0-10V analog outputs
• -10B	Bipolar ±10V analog outputs

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